Name Period Date

SECTION 11.4 | HARDY-WEINBERG EQUILIBRIUM

Power Notes

Hardy-Weinberg equilibrium: allele frequency in a population stay the same from 1 generation to the next.

Why is it important:

shows the factors that impact/lead to evolution

Five Conditions Required to be in Equilibrium ∴ Not Evolving

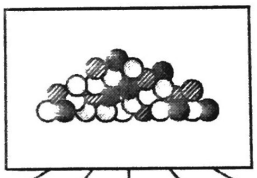
1. Large Population
2. No Natural Selection
3. No Mutation
4. Random Mating
5. No Migration (No Gene flow)
   - Immigra
   - Emigra

Hardy-Weinberg equation: p^2 + $2pq$ + q^2 = 1

What it means: Genotypic frequency

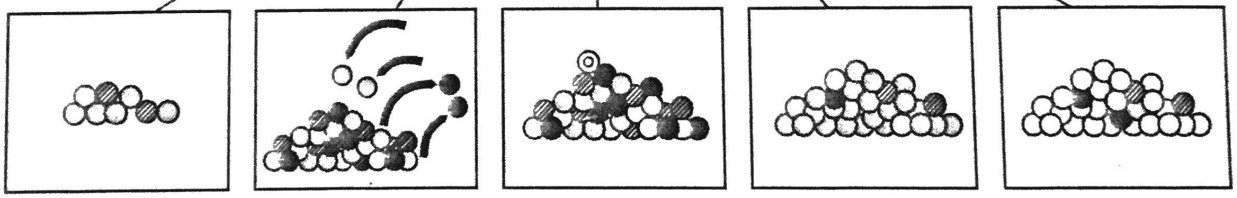
How it is used:

- p^2 = AA, homo domin
- $2pq$ = Aa, hetero
- q^2 = aa, homo recessive



Initial Population

Five Factors that Can Lead to Evolution



1. Small population → Genetic Drift → Founders Bottleneck
2. Migration → Imm, Em
3. Mutations
4. Sexual Selection
5. Natural Selection

$p^2 + 2pq + q^2 = 1$ $\quad p + q = 1$

✱ Always find q^2 first

Cystic Fibrosis is recessive, and 1 in 2,500 are affected

$$q^2 = \frac{\#\text{ recessive alleles}}{\text{total }\#\text{ alleles}} = \frac{2}{5000} = .0004$$

$$q = \sqrt{q^2} = \sqrt{.0004} = .02$$

$$p + q = 1 \quad p + .02 = 1 \quad p = .98$$
$$-.02 \quad -.02$$

$$p^2 = (.98)^2 = .96$$

$$2pq = 2(.98)(.02) = .04$$

White is recessive. 5 out of 1,500 mice are white

$$q^2 = \frac{10}{3000} = .003$$

$$q = \sqrt{q^2} = .05$$

$$p = \quad p + q = 1 \quad p + .05 = 1 \quad = .95$$

$$p^2 = (.95)^2 = .90$$

$$2pq = 2(.95)(.05) = .095 \text{ or } .1$$

$$p^2 + 2pq + q^2 = 1$$
$$.90 + .1 + .003 = 1$$

$$p + q = 1$$
$$.95 + .05 = 1$$

✱ If allele frequency (p+q) change from generation to generation, then the population is evolving